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(54) Ratchet hand torque applying tool

(57) A hand tool comprises a body member and a drive head 16 rotatably

mounted on it. A ratchet mechanism is interposed between the drive head and body member such that the drive head can be selectively locked for rotation with the body member in one or the other or both directions of rotation of the body member, the ratchet mechanism includes retractable pawl members 26 mounted in the body member and selectively engageable with teeth 21 on a circular member 20 in the drive head. A control collar 30 is interposed between the body member and the drive head. It is rotatable to control the actuation of the pawl members by cooperation with arcuate slots 31 in a face which selectively cam down pawls to disengage them from the teeth. The pawls, in diametric pairs, have oppositely facing tooth engaging faces 28 to provide the either direction drive. The head takes screwdriver blades or sockets.

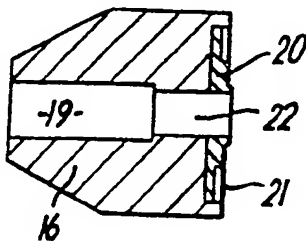


FIG. 4

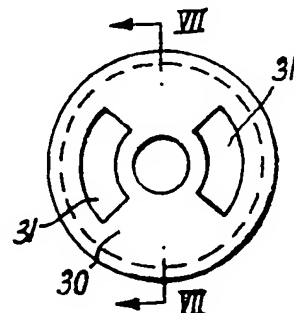


FIG. 6

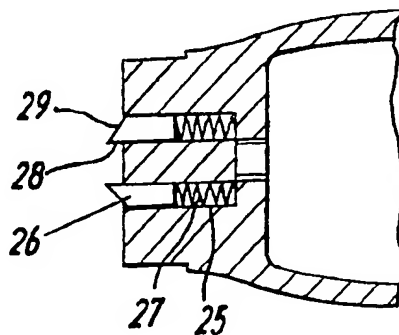


FIG. 10

SPECIFICATION

Ratchet tools

5 This invention relates to ratchet tools.

Various forms of ratchet tools in the nature of, for example, screwdrivers are known but these are generally capable of only relatively light duty as they are not of robust construction and are not capable of
10 withstanding high torque.

It is an object of the present invention to provide a ratchet tool of robust construction which may be used for relatively heavy duty applications.

The invention provides a hand tool comprising a
15 body member, a drive head rotatably mounted on the body member and a ratchet mechanism interposed between the drive head and the body member, the ratchet mechanism comprising opposed circular members associated with the body member
20 and the drive head respectively and disposed in planes at right angles to the axis of rotation of the drive head, one of said members being provided with a series of radially arranged teeth and the other being provided with pawl members engageable with
25 said teeth, and a control collar interposed between the body member and the drive head and rotatable between alternative positions in which selected ones of said pawl members are operatively engaged with the said teeth to permit rotation of said drive head
30 relative to said body member in one direction or in the other or to lock same against rotation in either direction.

Preferably two pairs of pawl members are provided, the pawl members of each pair being disposed diametrically opposite one another, the respective pairs having operative tooth-engaging faces directed in opposite directions and said control collar incorporating arcuate apertures through which said pawl members may project, the arrangement being such that in one position of said control collar one of said pairs of pawl members projects therethrough into engagement with said teeth to permit rotation of the drive head in one direction relative to said body member, in another position of
45 the control collar the other pair of pawl members project therethrough into engagement with said teeth to permit rotation of the drive head relative to said body member in the other direction, and in a third position of the control collar both pairs of pawl
50 members project therethrough into engagement with said teeth whereby to lock the drive head against rotation relative to the body member.

Preferably the pawl members are provided on the portions opposite to said operative faces with cam surfaces operable in association with peripheral regions of said apertures in the control collar to retract respective pairs of said pawl members to inoperative positions beneath said control collar on rotation of same to said first or second positions. The control
60 collar may advantageously be retained in each of said operative positions by a detent resiliently mounted in said body member and engageable in locating apertures in said control collar to retain same in the desired operative position.

65 Said pawl members are preferably resiliently

biased in a direction towards said teeth for automatic engagement therewith when aligned with said apertures in the control collar.

Said teeth preferably comprise a series of radially extending ribs arranged circumferentially about the surface of the associated circular member, preferably at intervals of 20° or less. The drive head is preferably secured to said body member by a threaded stud extending centrally through the drive head, the drive head also being provided with locating means for screwdriver blades, sockets or similar tools.

The body member may be provided with a detachable handle serving to provide increased leverage during use and may be adapted to receive alternative forms of handle or drive head to meet different requirements.

An embodiment of the invention will now be described, by way of example only, with reference to
85 the accompanying drawings in which:

Figure 1 is a side elevation of one form of ratchet tool according to the invention;

Figure 2 is an exploded view of the drive head incorporated in the tool shown in *Figure 1*;

90 *Figure 3* is a view in the direction of the arrow III in *Figure 2*;

Figure 4 is a cross-section on the line IV - IV in *Figure 3*;

Figure 5 is a view on the line V - V in *Figure 2*;

95 *Figure 6* is a view of the control collar on the line VI - VI in *Figure 2*.

Figure 7 is a cross-section on the line VII - VII in *Figure 6*;

Figure 8 is an enlarged cross-section similar to that of *Figure 6* showing the ratchet pawls in association with the control collar;

Figure 9 is a view on the line IX - IX in *Figure 2*;

Figure 10 is a cross-section on the line X - X in *Figure 9*; and

105 *Figure 11* is a cross-section on the line XI - XI in *Figure 9*.

Referring to *Figure 1* the tool comprises a body member 15 provided with a drive head 16 rotatably movable relative to the body member and adapted to receive detachable screwdriver blades, sockets, or similar tools. A ratchet mechanism is interposed between the drive head 16 and the body member 15 to permit rotation of the tools in one direction or the other or to lock same against rotation relative to the body member. A detachable extension handle 17 is provided which may, if desired, be hollow and adapted to serve as a container for screwdriver blades or other fitments adapted for use with the tool.

120 Referring now to *Figures 2-11*, the ratchet mechanism incorporates components mounted on the drive head 16 and the body member 15 together with a control collar 18 interposed therebetween, as seen in *Figures 1* and *2*. The drive head is shown in *Figures 3-5* and incorporates a square section socket 19 adapted to receive shank portions of alternatively useable screwdriver blades and of a drive shaft on which alternatively useable sockets may be selectively mounted. The end face of the drive head
125 opposite to that in which the socket 19 is formed

incorporates a circular recess in which is accommodated a circular member 20 provided with a series of closely spaced radially extending teeth 21 arranged circumferentially about the central axis of the drive head. In the illustrated embodiment 24 of such teeth are shown spaced at 15° intervals. The socket 19 communicates with a circular bore 22 through which a stud 23 (Figure 2) may be passed to secure the drive head to the body member 15.

Referring now to Figures 9-11, the portion of the body member 15 adjacent to the drive head 16 is provided with four axially extending bores 25 in each of which is slideably located a pawl member 26 resiliently urged by means of a compression spring 27 in a direction towards the drive head 16 so as to project beyond the end face of the body member which defines a circular member disposed in a plane parallel and adjacent to the circular member 20 carried by the drive head. Each of the pawl members 26 is provided with a flat operative face 28 and an inclined cam face 29, the pawl members being disposed in pairs with the pawl members of each pair being disposed diametrically opposite one another and having their operative faces 28 directed in the same direction relative to the circumference of the end face of the body member. In this way each pair of pawl members 26 may be selectively engaged with the teeth 21 carried by the drive head to permit rotation of the drive head relative to the body member in one direction or the other or to lock same against rotation.

Operation of the ratchet mechanism is effected by means of the control collar 18 which is interposed between the drive head 16 and the body member 15 and is shown in Figures 6 and 7. The collar is adapted to fit over the end portion of the body member 15 and has a flat circular face 30 which sits against the circular end face of the body member. A pair of diametrically opposed arcuate apertures 31 are provided in the plate 30 and the pawl members 26 project through the apertures 31 into engagement with the teeth 21. The arcuate extent of the apertures 31 is such that they may each embrace two of the pawl members simultaneously as shown in Figure 8. In this position the control collar permits engagement of all four pawl members with the teeth 21 and prevents rotation of the drive head 16 relative to the body member 15. If the control collar is rotated in a clockwise direction from the position shown in Figure 8 one pair of pawl members (shown at 26A in Figure 8) are cammed beneath the surface of the plate 30 leaving the other pair 26B projecting through the plate 30 into engagement with the teeth 21. In this position the drive head 16 may rotate in an anti-clockwise direction relative to the body member 15. If the control collar 18 is rotated in an anti-clockwise direction from the position shown in Figure 8, the pawl members 26B are cammed beneath the surface of the plate 30 leaving the pawl members 26A projecting through the apertures 31 into engagement with the teeth 21. This permits the drive head 16 to rotate clockwise relative to the body member 15.

The end portion of the body member 15 adjacent to the ratchet mechanism is provided with a radial

bore 32 (Figure 11) in which a spring urged pawl 33 is located which engaged with one of three apertures formed in the skirt portion of the control collar 18 to retain same in its selected angular position relative to the body member 15. A central bore 34 extends through the end portion of the body member 15 as shown in Figure 11 and incorporates a threaded insert with which the stud 23 may be engaged to secure the drive head and ratchet mechanism to the body members.

The stud 23 may be retained in position against rotation by means of a grub screw 35 located in a radial bore 36 as seen in Figure 11.

The arrangement described is of extremely robust construction and enable the tool to be used for application of relatively high torque forces. The construction of the ratchet mechanism is such that at least two pawl members in diametrically opposite portions are operative at any one time and by virtue of the relatively large number of teeth provided on the drive head the mechanism can be operated where very limited angular movement is possible. The control collar provides a simple but strong and positive action and substantial leverage can be exerted by means of the extension handle 17. The ratchet mechanism enables rotation of the drive head in one or other direction and locking of the drive head against movement relative to the body member thereby providing considerable versatility. The drive head may accommodate a wide variety of selectively useable bits or tools in the nature of screwdriver blades, sockets or the like.

Various modifications may be made without departing from the invention. For example a drive head may be provided with an adjustable collet, chuck or the like to receive and locate bits or tools, the number of teeth provided on the circular member associated with the drive head may be varied and there may be more than two pawl members operative in each direction of rotation. The tool may also be provided with a variety of detachable handles or other fitments and could also be provided with alternatively usable drive heads for different purposes.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicants claim protection in respect of any patentable feature or combination of features hereinbefore referred to whether or not particular emphasis has been placed thereon.

CLAIMS

1. A hand tool comprising a body member, a drive head rotatably mounted on the body member and a ratchet mechanism interposed between the drive head and the body member, the ratchet mechanism comprising opposed circular members associated with the body member and the drive head respectively and disposed in planes at right angles to the axis of rotation of the drive head, one of said members being provided with a series of radially arranged teeth and the other being provided with pawl members engageable with said teeth, and

a control collar interposed between the body member and the drive head and rotatable between alternative positions in which selected ones of said pawl members are operatively engaged with the
5 said teeth to permit rotation of said drive head relative to said body member in one direction or in the other or to lock same against rotation in either direction.

2. A hand tool as claimed in claim 1, in which two
10 pairs of pawl members are provided, the pawl members of each pair being disposed diametrically opposite one another, the respective pairs having operative tooth-engaging faces directed in opposite directions and said control collar incorporating arcuate apertures through which said pawl members
15 may project, the arrangement being such that in one position of said control collar one of said pairs of pawl members projects therethrough into engagement with said teeth to permit rotation of the drive
20 head in one direction relative to said body member, in another position of the control collar the other pair of pawl members project therethrough into engagement with said teeth to permit rotation of the drive head relative to said body member in the other
25 direction, and in a third position of the control collar both pairs of pawl members project therethrough into engagement with said teeth whereby to lock the drive head against rotation relative to the body member.

3. A hand tool as claimed in claim 1 or claim 2, in which the pawl members are provided on the portions opposite to said operative faces with cam surfaces operable in association with peripheral regions of said apertures in the control collar to retract
35 respective pairs of said pawl members to inoperative positions beneath said control collar on rotation of same to said first or second positions.

4. A hand tool as claimed in claim 2 or claim 3, in which the control collar is retained in each of said
40 operative positions by a detent resiliently mounted in said body member and engageable in locating apertures in said control collar to retain same in the desired operative position.

5. A hand tool as claimed in any one of the
45 preceding claims, in which said pawl members are resiliently biased in a direction towards said teeth for automatic engagement therewith when aligned with said apertures in the control collar.

6. A hand tool as claimed in any one of the
50 preceding claims, in which said teeth comprise a series of radially extending ribs arranged circumferentially about the surface of the associated circular member.

7. A hand tool as claimed in claim 6, in which the
55 teeth are arranged at intervals of 20° or less.

8. A hand tool as claimed in any one of the preceding claims, in which the drive head is secured to said body member by a threaded stud extending centrally through the drive head.

9. A hand tool as claimed in any one of the
60 preceding claims, in which the drive head is provided with locating means for screwdriver blades, sockets or similar tools.

10. A hand tool as claimed in any one of the
65 preceding claims, in which the body member is

provided with a detachable handle serving to provide increased leverage during use.

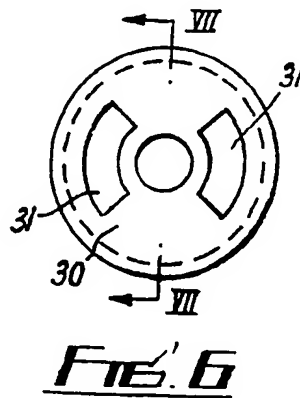
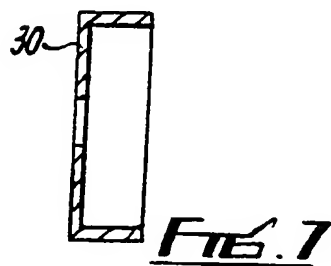
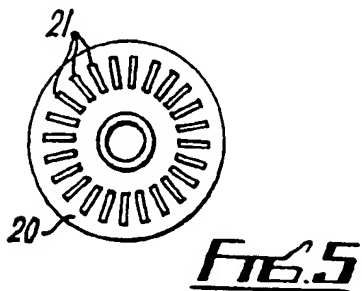
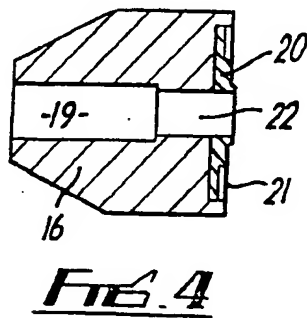
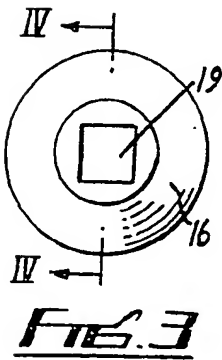
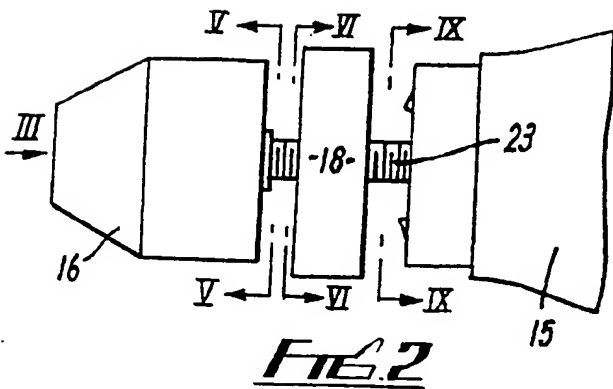
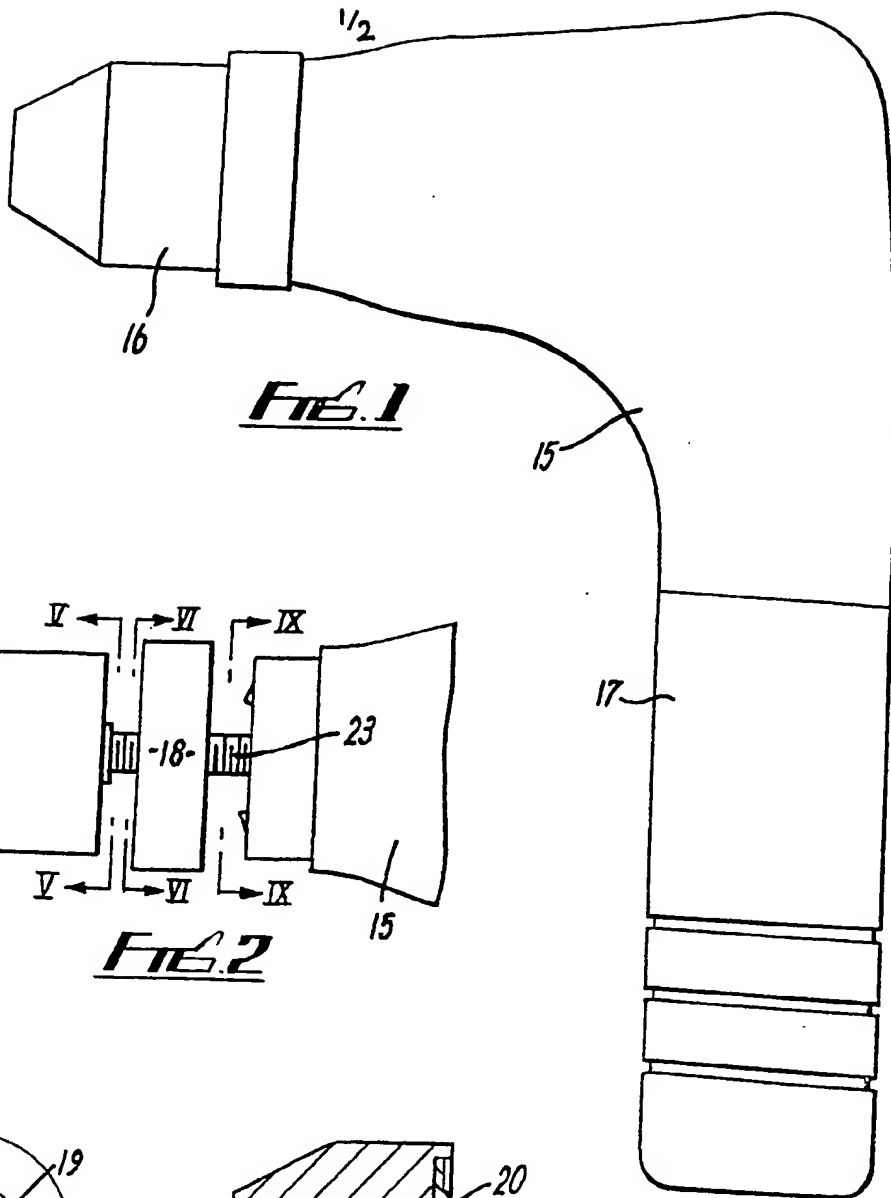
11. A hand tool as claimed in any one of the preceding claims, in which the body member is
70 adapted to receive alternative forms of handle or drive head to meet different requirements.

12. A hand tool substantially as hereinbefore described with reference to the accompanying drawings.

13. Any novel subject matter or combination
75 including novel subject matter herein disclosed, whether or not within the scope of or relating to the same invention as any of the preceding claims.

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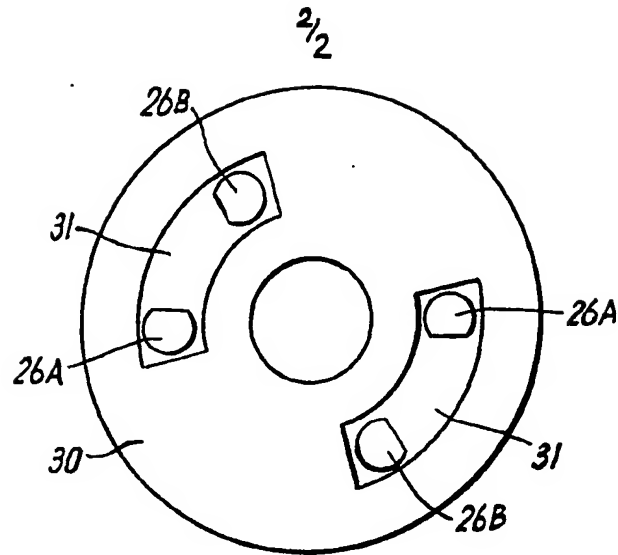


FIG. 8

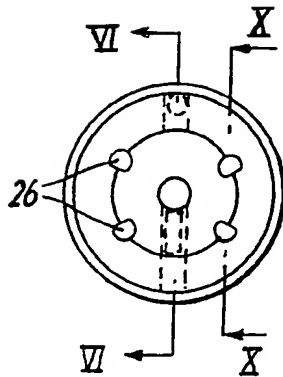


FIG. 9

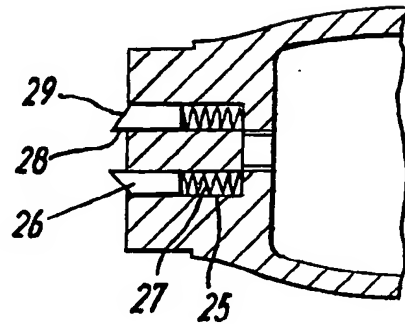


FIG. 10

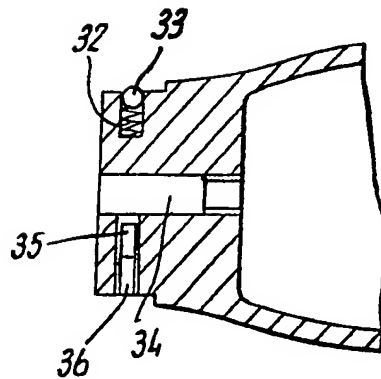


FIG. 11